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EDITOR, - - KATHARINE BRANDEGEE

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VOL. V. SEPTEMBER–OCTOBER, 1900. NO. 4–5

PRELIMINARY NOTES ON WEST-COAST PORPHYRAS.*

H. T. A. HUS.

Up to a few years ago our knowledge of the members of the genus Porphyra occurring on the West Coast of North America, was exceedingly meager. But few efforts had been made to distinguish between the various species, the names *P. vulgaris* or *P. laciniata*, being applied to them all.

J. G. Agardh ('82) reported *P. perforata* and *P. coccinea (P. naiadum?)* from the Pacific Coast. In 1891 Dr. Anderson added two new species, *P. naiadum* and *P. Nereocystis*, while Tilden ('98) credited four species of Porphyra to the Pacific Coast, viz., *P. miniata*, *P. naiadum*, *P. leucosticta*, and *P. laciniata*.

Some of the species above mentioned, proved, on examination, to be identical with others, so that, up to 1899, there had been reported from the West Coast of North America but four species, viz., *P. perforata*, *P. naiadum*, *P. Nereocystis*, and *P. miniata*. To this number we have added nine species or varieties, among which there are four new ones.

This notice is intended merely as a preliminary, awaiting the publication of the author's carefully prepared notes and drawings.

KEY.

1. Fronds monostromatic.....2
   Fronds distromatic.....7
   Fronds monostromatic or distromatic 11
2. Base cushion-shaped, consisting of parenchymatous cells.....*P. naiadum*.
   Base discoid, consisting of agglutinated, rhizoid-like cells 3

*Contributions from the Botanical Laboratories of the University of California. No. 12.

3. 32 spores in each sporocarp.....4
   8 spores in each sporocarp.....6
4. Fronds monœcious.....5
   Fronds diœcious.....*P. perforata f. lanceolata.*
5. Fronds brown-purple, 45–150μ thick.....*P. perforata.*
   Fronds brown-purple, 60μ thick, with thick partition walls.....*P. perforata f. segregata.*
   Fronds red-purple, 25–60μ thick, with thin partition walls.....*P. Nereocystis.*
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8. 16 antherozoids in each antheridium.....*P. amplissima.*
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9. Fronds 25μ thick, except at base.....*P. tenuissima.*
   Fronds 30–75μ thick.....*P. miniata f. cuneiformis.*
10. Fronds 100–220μ thick.....*P. variegata.*
    Fronds 45–75μ thick.....*P. occidentalis.*
11. Fronds 25μ thick.....*P. abyssicola.*

PORPHYRA LACINIATA (Lightf.) Ag. Syst. Alg., p. 190, 1824.

P. laciniata is distinguished from *P. perforata* and from *P. leucosticta*, with which it has frequently been confounded, by the thickness of the frond (30–45μ), by its diœcious (rarely monœcious) character, and by the number of reproductive bodies:—each sporocarp containing 8 (or 16) carpospores and each antheridium containing 64 (or 128) antherozoids.

Habitat. On rocks, or epiphytic on *Fucus evanescens*. Throughout the litoral and upper sublitoral zones.

Distribution. What the author believes to be the *P. laciniata* of European authors, appears, as far as can be judged from collections examined, to be limited to the shores of Alaska (61°–54° N. lat.).

Localities. Orca, Alaska, *W. A. Setchell No. 5164!;* Yakutat, Alaska, *Rev. Albin Johnson No. 14!;* Uyak Bay, Kadiak Isl., Alaska, *W. A. Setchell No. 5099!;* Amaknak Isl., Alaska, *W. A. Setchell No. 3270! No. 3269!*

PORPHYRA LACINIATA F. UMBILICALIS Ag., Icones Alg., Tab. 26, 1828.

Distribution. Pribilof Islands, Bering Sea, *U. S. S. Albatross!* (according to Setchell '99) (57° N. lat).

PORPHYRA LEUCOSTICTA Thur. in le Jolis, Liste des Algues Marines de Cherbourg, p. 100, 1863.

P. leucosticta is distinguished from *P. laciniata* by its monœcious character, and from *P. perforata* by the thickness of the frond (25–50μ), by the peculiar arrangement of the antheridia which form small, narrow, yellowish patches along the dark cerise sporocarps, and further by the number of reproductive bodies:—each sporocarp containing 8 carpospores and each antheridium containing 64 antherozoids, usually arranged in the form of two hollow spheres.

Habitat. On rocks and epiphytic on algæ. Lower litoral and sublitoral zones. March to May.

Distribution. This species appears to be limited, on the Pacific Coast, to a single locality, Monterey Bay, Calif. (36° 45′ N. lat.).

Localities. Pacific Grove, Calif.; *M. A. Howe!; Mrs. J. M. Weeks!; W. A. Setchell No. 5161!;* Santa Cruz, Calif., *Mrs. J. M. Weeks!*

PORPHYRA PERFORATA J. Ag. Till Alg. Syst. VI, p. 69, 1882.

The perforate condition of the fronds of this species does not appear to be characteristic.

P. perforata appears to be the most common of all species of Porphyra of the Pacific Coast, and wherever it occurs is usually found in great profusion.

P. perforata differs from *P. laciniata* by its monœcious character and by the number of reproductive bodies:—each sporocarp containing 32 carpospores and each antheridium containing 128 antherozoids.

Habitat. On rocks, wood, and barnacles. Epiphytic on *Zostera*, *Phyllospadix*, *Nitophyllum*, *Fucus*, and *Gigartina*. Throughout the litoral and in the upper part of the sublitoral zones. January to December.

Distribution. This species appears to be confined to the Pacific Coast, where it occurs from Alaska to Southern California (61°–32° 20′ N. lat.).

Localities. Orca, Alaska, *W. A. Setchell No. 5159!;* Glacier Bay, Alaska, *de A. Saunders No. 100!;* Baranof Isl., Alaska, *de A. Saunders No. 130!;* Shumagin Isl., Alaska, *de A. Saunders No. 394!;* Chehalis Bay, Wash., *Ralph Emerson, No. 1792!;* Crescent City, del Norte Co., Calif., *H. Hus!;* Trinidad, Humboldt Co., Calif.; *H. Hus!;* Duxbury Reef, Marin Co., Calif., *W. A. Setchell No. 1055! H. Hus!;* Farallone Isl., Calif., *H. Hus!;* Land's End, San Francisco, Calif., *W. A. Setchell No. 2034! H. Hus!;* Monterey, Calif., *W. A. Setchell! H. Hus!;* San Simeon Bay, Calif., *Dr. Palmer!;* Port Harford, Calif., *W. A. Setchell No. 1139!;* Santa Barbara, Calif., *Mrs. Cooper!;* San Diego, Calif., *Miss Reed!*

PORPHYRA PERFORATA F. SEGREGATA Setchell et Hus MS.

Membranous, 2–20 cm. long, 1–8 cm. broad; oblong lanceolate with undulate margin, often much expanded and laciniate; base more or less umbilicate; attached by a disc; gray to brown-purple, becoming blue-purple on drying; monostromatic; vegetative part of frond 60μ thick; cells square or slightly higher than broad; surface jelly thick, often forming one-half the thickness of the frond; monœcious; sporocarps and antheridia in irregular patches, radiating towards the margin of the frond; vegetative cells often mixed in with the sporocarps, never with the antheridia; each sporocarp containing 32 carpospores, each antheridium containing128 antherozoids; both carpospores and antherozoids divided into distinct groups by thick jelly-walls.

This plant agrees in many respects with the species, but the smaller size of the fronds, their lesser thickness, the form of the base, and especially the greater thickness of the jelly-walls entitle it to a separate place.

The great thickness of the jelly-walls may be seen advantageously in a surface view of the vegetative portion of the frond, but an best be seen in a cross section of the reproductive cells, being especially noticeable in case of the antheridia. The wall laid down by the first reproductive division of the antheridium is very

thick, and widely separates the antherozoids into an upper and a lower group.

Distribution. From Washington southward to Lower California (47° 30′–27° 8½′ N. lat.).

Localities. Shillshole Bay, Seattle, Washington, *Miss J. E. Tilden* (as *P. leucosticta*)*!;* San Diego, Calif., *Mrs. M. S. Snyder!;* San Roque, Mexico, *G. Eisen!*.

PORPHYRA PERFORATA F. LANCEOLATA Setchell et Hus MS.

Membranous, 10–325 cm. long, 1–10 cm. broad; linear, with undulate margin; base cuneate to cordate, attached by a disc; steel-gray to gray or yellow-brown, becoming purple on drying; monostromatic; vegetative part of frond 75–150μ thick; cells 1 ½–4 times as high as broad; surface jelly very thick, forming ⅖ to ½ the thickness of the frond; diœcious; each sporocarp containing 32 carpospores; each antheridium containing 128 antherozoids.

Between this plant and the species there exist a number of differences, chief among which is the fact that the variety is diœcious, or, in case of forked fronds, sometimes subdiœcious.

Habitat. P. perforata f. lanceolata usually grows on rocks in the highest part of the litoral zone, January to December.

Distribution. From San Francisco southward to Monterey Bay (37° 47′–36° 45′ N. lat.).

Localities. Land's End, San Francisco, Calif.; *W. A. Setchell! H. Hus!;* Carmel Bay, Monterey Co., Calif., *W. A. Setchell! R. E. Gibbs!*

PORPHYRA NEREOCYSTIS And. ZOE, Vol. II, p. 221, 1891 (name only), ZOE, Vol. III, p. 149, 1892 (descr.).

There exists little doubt in the writer's mind but that this species is identical with *Pyropia Californica* of J. G. Agardh ('99). It may be distinguished from *P. perforata* and *P. perforata f. segregata* by the red-purple color of the frond, by its greater size and by the arrangement of the antheridia in large, sharply-defined spots. The number of carpospores and antherozoids, and their arrangement is identical with that of the above-named species.

Habitat. *P. Nereocystis* is found attached to the stipes of *Nereocystis Lütkeana* in 3-5 fathoms of water.

Distribution. From Alaska southward to Middle California (57° 30′–36° 45′ N. lat.).

Localities. St. Paul, Kadiak Isl., Alaska, *W. A. Setchell* and *A. A. Lawson! No. 5149;* Coupeville, Washington, *N. L. Gardner!;* Bolinas Bay, Marin Co., Calif., *W. A. Setchell! No. 1275;* Monterey Bay, Calif., *W. A. Setchell! No. 3065a; C. L. Anderson!*

PORPHYRA NAIADUM And. ZOE, Vol. III, p. 148, 1892.

This plant may readily be distinguished from all other species of Porphyra by its base. While the structure of the base of all Pacific Coast species examined, agrees with that so admirably described by Bornet and Thuret ('78) for *P. laciniata*, the base of *P. naiadum* possesses a structure altogether different.

P. naiadum is found growing on eel-grass, either on *Phyllospadix* in exposed places in the sublitoral zone or on *Zostera*, sheltered, in lagoons. When, during the winter months, we examine the blades of *Phyllospadix*, we find here and there, small, reddish-brown, cushion-shaped growths, which to the superficial gaze appear like colonies of diatoms. Continued observation shows a gradual increase in the number of wartlike, more or less flattened structures. Finally they cover the blades of eel-grass in such large numbers that they grow next to and over each other, and lose their natural hemispherical shape, obscuring the normal color of the eel-grass, and giving a rough appearance to the blade.

As the season advances, examination with a lens shows a greater or smaller number of short, blunt protuberances issuing from the wartlike growths. Under the microscope they appear to be composed of a number of cells placed end to end. Further observation demonstrates the fact that these cells, by division in two planes, give rise to a monostromatic frond. From this it is but a step to establish a genetic connection between these hemispherical structures and the fully grown fronds of *P. naiadum.*

The base itself is composed of a few layers of parenchymatous cells, the upper layer of which gives rise to the fronds, while the

cells of the layer adjacent to the surface of the blade of the host-plant produce rhizoid-like projections which enter, to a very slight extent, the cuticula of the host-plant.

This parenchymatous base enables us to distinguish easily between this species and *P. abyssicola*, though there also exists a difference in the reproductive bodies, *P. naiadum* being apparently dicœcious, each sporocarp containing 8 carpospores.

Habitat. *P. naiadum* occurs exclusively on *Phyllospadix* and *Zostera*. In sheltered places we find it all through the winter, but where the eel-grass is exposed to the violence of the waves the Porphyra disappears about August, to reappear in the prothalloid form in the latter part of January.

Distribution. This plant appears to be limited to the Pacific Coast, occurring from Washington to Southern California (48° 10′–32° 20′ N. lat).

Localities. Coupeville, Washington, *N. L. Gardner!;* Ballard Beach, Seattle, Washington, *Miss J. E. Tilden!;* Cresent City, Del Norte Co., Calif., *H. Hus!;* Fort Ross, Sonoma Co., Calif., *W. A. Setchell No. 1789!;* Duxbury Reef, Marin Co., Calif., *W. A. Setchell No. 1037! H. Hus!;* Farallone Isl., Calif., *T. W. Blankinship;* Land's End, San Francisco, Calif., *W. A. Setchell! H. Hus!;* Monterey, Calif., *W. A. Setchell! C. P. Nott! R. E. Gibbs! H. Hus!;* Santa Cruz, Calif., *C. L. Anderson!;* San Pedro, Calif., *A. J. McClatchie;* San Diego, Calif., *Miss Reed No. 107!*

PORPHYRA AMPLISSIMA (Kjellm.). Setchell et Hus MS.

Diploderma amplissimum (Kjellm.). The Algæ of the Arctic Sea, p. 188, 1883.

This species can be distinguished from other distromatic species by the number of reproductive bodies, each sporocarp containing 4–8 carpospores, each antheridium containing 16 antherozoids.

Habitat. On rocks in the sublitoral zone. Also found floating.

Distribution. From Alaska southward to Washington (60°–48° 10′ N. lat.).

Localities. Orca, Alaska, *W. A. Setchell and A. A. Lawson*

No. 5165!; de A. Saunders No. 259a!; Unga, Alaska, *W. A. Setchell* and *A. A. Lawson No. 5047!;* Amaknak Isl., Alaska; *W. A. Setchell No. 3268!;* Coupeville, Washington, *N. L. Gardner No. 47!*

PORPHYRA MINIATA F. CUNEIFORMIS Setchell et Hus MS.

Fronds membranous, 15–50 cm. long, 4–15 cm. broad, lanceolate with undulate, crenulate margins; red-purple; *base strongly cuneate*, attached by a disc; fronds distromatic, often monostromatic near the edges in the vegetative part; 30–75μ thick; cells square or twice as long as broad; surface jelly 10–12.5μ thick; *fronds monœcious*, antheridia and sporocarps intermixed in marginal zone, gradually spreading over the whole frond:—each sporocarp containing 4 carpospores and each antheridium consisting of 8 antherozoids.

Habitat. Found floating.

Distribution. From Alaska southward to Middle California (60°–36° 45′ N. lat.).

Localities. Gulf of Alaska, *de A. Saunders No. 20!;* Coupeville, Washington, *N. L. Gardner!;* Monterey Bay, Calif., *Mrs. J. M. Weeks!*

PORPHYRA TENUISSIMA (Strömf.) Setchell et Hus MS.

Diploderma tenuissimum. (Strömf.) Bot. Centrallblatt, Vol. 26, p. 73.

This species may be readily distinguished from other distromatic species by its great thinness, which varies between 25–30μ in the upper part of the frond, while at the base the thickness is constantly 75μ. Each sporocarp contains 4 carpospores and each antheridium 8 antherozoids.

Habitat. Epiphytic on algæ; also on rocks (?).

Distribution. As yet known on the West Coast of North America only from Alaska (57° N. lat.).

Locality. Sitka, Alaska, *de A. Saunders No. 148a!*

PORPHYRA ABYSSICOLA Kjellm. Algæ of the Arctic Sea, p. 191, 1883.

P. abyssicola may be distinguished from *P. tenuissima* by the

constant thickness of the frond 25μ, which in the latter species, in the region of the base, becomes 75μ. The species is distinguished from *P. naiadum* chiefly by its base, the latter being discoid and composed of agglutinated, rhizoid-like cells, and also by the reproductive bodies. *P. abyssicola* is monœcious (rarely diœcious):—each sporocarp containing 2–4 carpospores and each antheridium containing 8 antherozoids.

Habitat. On *Zostera.*

Distribution. As yet known on the Pacific Coast from but a single locality (48° 10′ N. lat.).

Locality. Whidby Isl., Washington, *N. L. Gardner, No. 273!*

PORPHYRA VARIEGATA Kjellm. in litt.

Diploderma variegatum Kjellm., Om Beringhafvets Algflora, p. 33, 1889.

This species is readily distinguished from all other distromatic species of Porphyra by its great thickness (100–220μ), by the great thickness of the jelly-walls, especially those of the vegetative cells which are found between the sporocarps, and by the variegated appearance of the fertile frond, from which the species probably derives its name. The plant is apparently diœcious. Each sporocarp contains 32 carpospores.

Habitat. On rocks.

Distribution. From Bering Island, Siberia, to Middle California (55°–36° 45′ N. lat.).

Localities. Bering Isl., *Kjellman;* Coupeville, Washington, *N. L. Gardner!;* Monterey Bay, California, *C. L. Anderson! C. P. Nott! Mrs. J. M. Weeks!*

PORPHYRA OCCIDENTALIS Setchell et Hus MS.

Fronds membranous, 15–30 cm. long, 1.5–5 cm. broad, linear *with slightly crenulate margin* and a cuneate to orbicular base, sessile on small disc; dull red; *distromatic, vegetative part of frond 45–75μ thick*, cells square or 1.5–2 times as broad as high, 12–15μ high, 12–30μ broad, surface jelly 10–15μ thick; *apparently diœcious*, antheridia forming a yellowish margin, measuring 65–75μ in cross-section; *64 antherozoids* in four tiers of 16 antherozoids in each antheridium.

Habitat. On rocks.

Distribution. As yet reported from but a single locality on he Pacific Coast (36° 45′ N. lat.).

Locality. Carmel Bay, Monterey Co., Calif., *Mrs. J. M. Weeks!*

University of California,
Berkeley, Cal., September 26, 1900.

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CONTRIBUTIONS TO SOUTHERN CALIFORNIA BOTANY. I.

S. B. PARISH.

EQUISETUM MEXICANUM Milde, Verhandl. 1882, 1256(?). The Southern California plant which recently has been referred here does not agree altogether satisfactorily with Milde's description. His species was founded on specimens collected by Muller in Orizaba, in 1855, and is perhaps of doubtful validity, having been included, with several other of Milde's species, in *E. giganteum* L. by Baker in the Handbook of Fern-Allies. San Bernardino specimens were placed in *E. variegatum* Schleich, by Underwood in Coville, Death Valley Report, 226, and the plant has been distributed by myself and others as *E. laevigatum* A. Br.

Whatever may be its proper name the plant is abundant in the intramontane region, ascending at least to 1,500 ft. alt., and reaching Santa Catalina Island.* In the desert region it has been collected at Palm Springs in the Colorado Desert, and on the Mojave River at Camp Cady. It is found in wet or drier sand, and usually in shaded situations, and is evergreen under suitable conditions, but in drier soil it vegetates in spring and early summer. **Fruit in June–July.**

SELAGINELLA WATSONI Underw. Bull. Torr. Club, 25.127. Summit of San Jacinto Mt., *Clinton S. Kimball*. High divide west of Bear Valley, alt. 7,500 ft., San Bernardino Mts., June, 1886, 1776 *Parish*.

SPHAERALCEA FENDLERI **Californica**. About 1 m. high; stems glabrate below; leaves oblong, 2–3 cm. long, more or less distinctly subhastately lobed, unevenly and obtusely toothed; flowers salmon-red; carpels 5 mm. long, indistinctly apiculate, the lower half strongly reticulate; seed nearly circular, 2 mm. in diameter, hirsute.

Near Colton, a single plant, May, 1894, 2,846 *Parish*. Campbell-Johnson Ranch, Garvanza, also a single plant, *L. A. Grata*,

* McClatchie, Eryth. 2, 122.

Nov., 1899. A specimen not yet in flower, and with leaves 4–7 cm. long, collected by *McClatchie* at San Pedro, May, 1896, probably belongs here.

ECHINOCACTUS CYLINDRACEUS Engelm. Pro. Am. Acad. 3.275. *E. Wislizeni* Engelm. in Brew. & Wats. Bot. Cal. 1.246, not Wisliz. Rep. 97. *E. Wislizeni Lecontei* Coulter, Contrib. U. S. Nat. Herb. 3.363, as to Californian plants, not Engelm. in Rothr. Wheeler's Rep. 6.128. Coville, Death Val. Rep. 110.

The "barrel" or "nail-keg cactus" of the Californian deserts is usually referred to the variety of *E. Wislizeni*, while *E. cylindraceus* has been more readily supplied by cactus-collectors than recognized by botanists. The type of the latter was collected in "rocky ravines, near San Felipe, on the eastern slope of the California Mountains, by Dr. Parry."* It was originally described as multicipital, but it was afterwards explained that such growths were due probably to accidental injuries by fire to the original stem.† It is now kept apart by certain differences in the radial spines. These in *E. cylindraceus* are said to number 15–17, all stout, the lower shorter and much hooked; while in *E. Wislizeni Leconti* there are 6–10 stout, and 12–20 slender and flexuous ones.‡ But too much stress has been placed on the number of ribs, and the number, size, degree of curvature and color of the spines. These characters are of value if taken broadly, but if insisted upon too closely one might easily select a half-dozen species from the plants growing on a single hillside. Yet one can not be familiar with the various forms which they assume without being convinced that all should be included in a single species.

A further distinction between the two species is found in the season of flowering. *E. Wislizeni* flowers through the entire season, and the type, which was collected at Doña Ana on the Rio Grande River in August, showed buds, open flowers, young and ripe fruit on the same specimen.§ Our Californian plants

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* Engelm. Cact. Mex. Bound. 25.
† Engelm. l. c.
‡ Coulter, l. c.
§ Engelm. Wisliz, Rep. 97.

are strictly spring flowering, ripening their fruit by early summer.

Our species is the most abundant Echinocactus of the desert region, occurring on hillsides or gravelly plains at 500–3,500 ft. alt., always present in suitable situations, often in great numbers. Usually columnar, with an extreme height of 8–9 ft., often, always when young, globose, or even clavate, rarely polycephalous from the base, or even near the summit; ribs indefinitely numerous; central spines 4, varying in width and absolute and relative length, curved or somewhat hooked, or twisted and interlocked, red, less frequently yellow, or even white; radial spines numerous, slender, more or less flexuous, mostly light-colored; flowers yellow; fruit dry.

OPUNTIA PARRYI Engelm. Am. Jour. Sci. Ser. 2, 14.339. This species was founded on a plant observed on the "eastern slope of the mountains near San Felipe" by Dr. Parry, and the brief description was taken from his notes.* Dr. Engelmann probably never saw the specimens, which, if any there were, must have been among those unfortunately lost on the Isthmus of Panama.† There are none in the Engelmann Herbarium.‡ Some uncertainty exists as to the identity of Parry's plant with one subsequently collected by Bigelow "on gravelly plains 30 miles west of the Colorado, near the Mojave River,"§ but as this was described more fully and figured, and as Bigelow's specimen is still preserved, it may well be considered as typical of the species.

Mr. A. H. Alverson collected in 1895 at McHaney's Mine, in the Colorado Desert, and has since had in cultivation, a plant which perfectly agrees with the description and figures cited, and which has the habit of growth in prostrate mats shown by an engraving in the North American Fauna.‖

GARRYA VEATCHII Kellogg, Proc. Cal. Acad. 5.40. Shrub 2–3 m. high; leaves elliptical, or the smaller lanceolate, 2–5 cm. long, the edges revolute, glabrous above, and beneath clothed

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* Engelm. Cact. Mex. Bound. 53.
† Parry, Pro. Davenp. Acad. 2.280.
‡ Coulter, Contrib. U. S. Nat. Herb. 3.441.
§ Engelm. & Bigelow, Pac. R. Rep. 4. 48, t. 22, f. 4–7.
‖ Merriam, N. Am. Fauna 7. 347, f. 10.

with a close pannose tomentum; aments 3–4 in a cluster, declined, 2–4 cm. long; bracts scarious, connate nearly to the strongly mucronate tips, silky; immature fruit densely white hairy, becoming less densely hairy at maturity.

In dry cañons on the intramontane slope of the San Antonio Mts. from San Gabriel * to Lytle Creek and Cajon Pass, at 1,500 3,500 ft. alt. Probably also includes a shrub of the desert slope of the San Bernardino Range; Rock Creek, *Davidson;* Cañon of the Mojave. This differs from the above in the pubesence of the under surface of the leaves, which is of short, straight hairs, becoming glabrate in age.

Arbutus Menziesii Pursh; Hook. Fl. 2. 36. This species, heretofore known in Southern California only by a small group on Mt. Wilson, has been discovered in the present year in Las Tuñas Cañon, near Santa Monica, by Dr. Hasse. There are but a few specimens, which are reduced to shrubs not exceeding 10 ft. in height.

Phlox Douglasii Hook. Fl. 2. 73, t. 158. Summit of Swarthout Cañon, 6,800 ft. alt., in the San Antonio Mountains, 1529 *H. M. Hall*, June, 1900.

"Flowers white to clear blue, fragrant." The specimen approaches very closely the var. *diffusa* Gray, Pro. Am. Acad. 8,254.

Gilia (Eugilia) **leptantha**. Annual; stems slender, much branched, 25–30 cm. high, below loosely woolly, becoming glabrous above, beset with numerous tack-shaped glands; leaves mostly basal, 2–3 cm. long, the thick midrib having a very narrow marginal blade with several linear, cuspidate, alternate tooth-like lobes, the rameal leaves reduced to minute subulate bracts; panicle diffuse; pedicels shorter than the calyx, or rarely much longer; calyx 3 mm. long, scarious, the green midribs prolonged as short, subulate, divergent teeth; corolla 10 12 mm. long, purple, the slender tube moderately dilated at the yellow throat; filaments at the sinuses of the corolla, and surpassing its

* Davidson, Pl. Los. Ang. Co. 11.

oblong lobes; capsule ovoid, shorter than the calyx-teeth; seeds white, 2 mm. long, minutely roughened.

Collected at Seven Oaks, 5,000 ft. alt., in the San Bernardino Mountains, June, 1900, by *Mr. and Mrs. Grout.*

Near *G. latiflora*, Gray, from which it is well distinguished by its much longer filiform tube.

GALIUM MULTIFLORUM **parvifolium**. Leaves approximate, thick, 4–6 mm. long, lateral nerves, and sometimes the midvein obsolete; fruit less densely hirsute than in the species.

On dry slopes in the San Antonio and San Bernardino Mts. at 6,500 9,000 ft. alt. Bear Valley, June, 1886, 1829 *Parish.* Summit San Antonio Mts., *McClatchie*, Aug., 1893.

Eupatorium Pasadenense. Of the Eximbricata section; stems slender and apparently herbaceous, glandular-puberulent; upper leaves opposite, short petioled, ovate-deltoid, acute, and at base cordate, serrate, thin, minutely atomiferous beneath; cymes rather compact, on dichotomous peduncles longer than the leaves, pedicels 1 cm. long, with 2–3 linear bracts; heads 20 30-flowered; involucral bracts lanceolate, firm, 4 mm. long, prominently 2-ribbed, the acute tips softer; corolla 4–5 mm. long, glabrous, white, the filiform tube twice the length of the abruptly expanded throat; pappus scabrous, equaling the corolla, very promptly deciduous; achenes smooth, 5-angled, slightly arcuate, 1.5 mm. long; receptacle a little rounded.

Wet bank of a pool in a cañon south of Pasadena, April 20, 1896, 1128 *A. J. McClatchie.*

Nearest *E. occidentale* Hook., but abundantly distinct in pubescence, character of the involucral scales and shape of the corolla.

Bidens speciosa. *B. Nashii* Wiegand, Bull. Torr. Club, 26. 421, as to the Californian plants only. Aquatic, perennial by stolons, glabrous throughout; stems erect or assurgent, stout, with an extreme height of 2.5 m., branched at every node, the lowest branches becoming stolons, the upper short, erect, their ultimate branchlets 1–3-flowered; leaves lanceolate, 1–2 dm. long, exceeding the internodes, conspicuously toothed, narrowed to the connate base; heads on peduncles 4–8 cm. long, erect, nodding

in fruit; outer involucral bracts 4 8, foliaceous, linear-oblong, serrate, equal, mostly twice longer than the head, reflexed; inner bracts 8, membranous, yellowish, acutely oval, equaling the disc; rays 8, golden-yellow, obovate-oblong, 2x1 cm., the tips entire or obscurely toothed; ovaries oblong, truncate, the edges retrorsly hispid; disc 2 cm. broad, 1 cm. high; its corollas light yellow, 6 mm. long, campanulate, the lower half abruptly contracted into a columnar base, 5-toothed; chaff linear-acute, as long as the florets, yellow-tipped; mature achenes black, flat, 5 mm. long, cuneate, very slightly constricted at the summit; awns 2, white, 3 mm. long, or with a third awn half as long, and the achene then ribbed on the awned face, awns and edges of the achenes retrorsly barbed with rigid prickles.

A handsome autumnal-flowering plant, common in shallow streams in the San Bernardino Valley, at about 1,000 ft. alt.; no doubt extending throughout the entire intramontane region of Southern California, and probably of much wider range.

From *B. chrysanthemoides* Michx. and *B. Nashii* Wiegand it differs by its perennial duration, conspicuously-toothed leaves, constantly foliaceous outer involucres, and cernuous fruiting heads. All the achenes in a head are usually 2-awned, and in the large number examined no heads were found in which there were not more 2-awned than 3-awned achenes; nor were any 4-awned achenes found, yet such may occur.

REDISCOVERY OF THERMOPSIS MACROPHYLLA H. & A.

BY ALICE EASTWOOD.

THIS species was originally collected by Douglas, probably near Monterey. Not since his time has it been found, unless a plant collected by Mr. Joseph Clark in Mendocino County in 1876, now in the Herbarium of the California Academy of Sciences, should prove to be the same.

Recently this species has been rediscovered by the Honorable

Horace Davis, near his country place in the Santa Cruz Mountains, about four miles from Glenwood.

This is a region where the cañons are filled with redwoods and their ever-accompanying vegetation; the hills are covered with chaparral; while here and there appear stretches of sand, white like that on the shores of the ocean. These sandy outcroppings are the remains of an old sea beach and tell some of the geological history of the country in bygone ages.

On one of these old beaches, in the dry sand and far from springs or running water, this Thermopsis lifts its erect stems to a height of three or four feet, somewhat surpassing the surrounding vegetation. It agrees with the description of the type as given in the foot-note below.

Not far away, the remains of an old Indian trail can be distinctly seen, in some places almost as wide as a road. This trail is said to have extended from Santa Cruz to Santa Clara and connected the two missions, though tradition claims that it was traveled before the missions existed.

It is not likely that the early botanical explorers made their way through the almost impenetrable brush or indeed went out of the beaten paths to any extent. So long as there were trails they would keep to them, when they made distant journeys. If we could discover these old trails, from one settlement to another, we would doubtless find all the rare and doubtful species which were collected by Douglas and others, the habitats of which are now unknown. It is not unlikely that this region may be the very place where Douglas collected *T. macrophylla.*

It differs from *T. Californica* Watson in the following points. *T. Californica* grows in wet, springy places, with stems generally decumbent; leaflets obovate, minutely mucronate at the obtuse apex, 1–2 inches long, silky tomentose on both surfaces; stipules

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"Thermopsis *macrophylla;* caule angulata, petiolis calycibus ovariisque hirsutissimus, foliis trifoliatis, foliolis obovato-ellipticis utrinque acutis supra glabris subtus pubescentibus, stipulis maximis (biuncialibus) ovatis acutis.

"Leaflets 4 inches long. Calyx angled, deeply 2-lipped; upper lip ovate, bidentate, lower 3-partite, the segments lanceolate-subulate. Stamens 10, free. Ovary linear, densely sericeo-villous, on a short glabrous stipes. A very fine and distinct species, with apparently white, but probably, when recent, yellowish flowers. Leaves much longer than in any hitherto known species." (Hooker & Arnott.) Bot. Beech. 329.

lanceolate to ovate-lanceolate, generally longer than the petioles; calyx with the upper lip truncately notched and the other teeth deltoid, acute or obtuse, shorter than the tube; bracts ovate-acuminate, surpassing the pedicels.

T. macrophylla grows in dry sand and has erect stems. The leaflets are thick, coriaceous, elliptical-oblong, acute at each end, 3 or 4 inches long, 1–3 inches broad, almost smooth on the upper surface, tomentose on the lower; stipules unequal-sided, ovate-lanceolate, acuminate, almost twice as long as the petioles; calyx angled, the upper lip barely toothed, the others lanceolate-acuminate, as long as the tube; pods immature, erect or falcate; bracts ovate, attenuate to a slender acumination.

The plant from Mendocino County, spoken of above, has much longer leaves, proportionally narrower; stipules broader and shorter. The calyx is not angled and the teeth are shorter. The bracts are less attenuate. When this is better known it may prove to be a distinct species, or all these Californian forms may be considered only geographical varieties of a polymorphous species. They must be studied in the field or, better still, cultivated in separate patches in the same garden before their status can be finally settled.

A NEW TAPIRIRA FROM BAJA CALIFORNIA.

T. S. BRANDEGEE.

Tapirira edulis. A tree 5–7 m. high with spreading branches and a trunk ⅔ m. in diameter, bark smooth and gray; leaves 8–10 cm. long, odd-pinnate and like the young branches pubescent; leaflets usually 4 pairs, sessile, 1–2½ cm. long, 1–1½ cm. wide, elliptical, apiculate; flowers diœcious, appearing with the young leaves, petals and sepals imbricated in the bud: male panicles 2–3 cm. long, bracteolate, 10–20 flowered, the female much smaller, 2–4-flowered; petals 5, oblong, 2 mm. long, pointed,

ochroleucous; sepals 5, lobes 1 mm. long, pubescent, the female flower slightly larger than the male; ovary of the male flower immersed in the disk, styles 5, minute, stamens 10 inserted at the edge of the disk, filiform, anthers globose; ovary of the female flower encircled by the 10-lobed cupulate disk, pubescent, stamens more slender and anthers smaller than those of the male flower, styles 5, conical, 2 mm. long; fruit oblique ovoid, 2½ cm. long, slightly pubescent, smooth excepting five pointed projections from which the styles have fallen, light yellow when mature.

In the Flora of the Cape Region,* this tree is mentioned as *Cyrtocarpa procera*, with which it was indentified owing to the lack of flowering specimens. A careful study of material since collected shows that it is nearest the genus Tapirira as elaborated by Engler † and although a few slight divergences are found they are not of generic value. It certainly does not belong to Cyrtocarpa which was reduced to Tapirira in Bentham and Hooker's Genera Plantarum. The ovary is five celled and by abortion becomes one seeded; of the aborted cells one is much the largest and its ovule is evident. The ovule is suspended from the vertex of the cell and by lengthening of the funicle the seed finally becomes inverted. The radicle is accumbent as in Engler's Series of the *Spondieæ Curvembryeæ*. Shortly after flowering the styles appear as if in a circle about the top of the forming fruit, but soon apparently the one belonging to the maturing seed becomes larger and its conical projection grows rapidly, thus making the fruit oblique. My specimens seem to show that the species is completely diœcious, but a careful examination in the field may prove it, like some other so called diœcious plants, to be somewhat polygamous. The trees in general appearance very much resemble Veatchia. It is called by the inhabitants of the Cape Region of Lower California, its habitat, "ciruela," a Spanish word for plum, and a name also given to the cultivated species of Spondias. The flowers appear in April and May, and the fruit is ripe in August and September, when its pleasing, slightly acid flavor causes it to be much sought.

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* Proc. Cal. Acad., Ser. 2, III, 103.

† Suites au Prodromus, IV, 276.

NEW SPECIES OF CALIFORNIA PLANTS.

ALICE EASTWOOD.

Salix Covillei. 1–2 meters in height, older stems chestnut brown, younger ones clothed with a glaucous bloom which persists at least through the second season. Leaves on flowering branches without stipules, oblong to oblanceolate, 3–5 cm. long, 5–10 mm. wide; petioles 2–3 mm. long; upper surface at first silky pubescent, later becoming almost glabrous; lower surface white, with short, silvery, silky hairs, densely appressed; apex and base acute; margins revolute at base, otherwise entire. Aments appearing before the leaves, sessile, scattered. Staminate aments ovate elliptical, short and broad, little more than 1 cm. long, and about 8 mm. broad, white, with the long silky hairs clothing the scales; these, broadly elliptical, acute at apex, dark brown, nearly 2 mm. long and about half as wide, clothed on both sides with fine white silky hairs, twice as long as the scale. Stamens two to each scale, filaments separate, about equaling the scales, inclined to be unequal; anthers with 4 cells; nectary ⅙ the length of the scale. Pistillate aments oblong, slightly broader at base, 2–2.5 cm. long, almost 1 cm. broad; scales rounded at summit, broadening to the base, 2 mm. long, 1.5 mm. wide, almost concealed by the dense covering of white hairs. Capsules ovate, sessile, sericeous, with short, white, appressed pubescence. Style slender, 1 mm. long, branches divided to the junction with the style, rather slender.

This was collected on Bubbs Creek, the south fork of Kings River, in Fresno County, California, July 10, 1899. It grew near the foot-bridge, along the edge of the creek. The pistillate aments were discharging their seed. The description of the staminate was drawn from some aments which had apparently been frozen before being fully developed, and so had persisted.

It seems to be identical with a specimen collected by Coville and Funston on the Death Valley Expedition (no. 1427). This was collected August 2, 1891, and is, of course, without flowers or fruit. It was identified with *S. macrocarpa argentea* Bebb* on

* Contr. U. S. Natural Herb. IV. 199.

account of the resemblance of the pubescence; but it is so unlike that species that it would be a waste of time to enumerate the differences. The differences in the appearance of the catkins, one peduncled and subtended with leaves, the others sessile, with no leaves at the base, mark the two as quite distinct.

It comes nearer to *S. bella* Piper, recently described in Torr. Bull. XXVII, 399; but this is without the glaucous bloom on the twigs, has different leaves, pedicellate capsules, and shorter filaments to the stamens. The leaves must be different or the specimens collected by Coville and Funston would not have been referred to *S. subcærulea* Piper, by the author of that species, in the same publication.

It is named in honor of F. V. Coville, who is probably the first collector of the species.

Chrysopsis camphorata. Stems many from a perennial, woody root, ascending 1–3 feet high, scabrous, sparingly pilose, densely glandular throughout, with sessile and short-stipitate glands, varying in size. Leaves oblong-lanceolate, entire, 1–3 cm. long, sharply acuminate, the base either cordately or auriculately clasping, midrib broad, apparently double: bud leaves forming fascicles in all the lower axils. Inflorescence open, cymose-paniculate, with short branches spreading almost horizontally, naked at the lower end, and with a few small leaves close to the head, these sessile by a truncate base, and with some long hairs on the lower margin; heads radiate, 1–3 terminating the short branchlets, about 8 mm. high. Bracts of the involucre imbricated in 3 or 4 series, linear-attenuate, with ciliate margins, membranous on each side of the glandular midrib, which is carinate on the longer bracts; lower bracts 3 mm. long; inner 9 mm., both about 3 mm. broad at base. Rays 9, yellow, oblong-elliptical, 6 mm. long, 2 mm. wide, 2–3-toothed at apex, sparingly glandular on the margin, and with a few glandular teeth on the lower surface near the base, upper surface furrowed. Inner pappus capillary, tawny, equaling the tube of the corolla; outer paleaceous, glabrous, about 1 mm. long. Corolla of disk flowers yellow, glabrous, with the 5 short, deltoid lobes surpassed by the stamens and stigmas, the latter hispid, 2 mm.

long. Akenes hoary, with appressed white hairs, linear-oblong, 3 mm. long, less than 3 mm. broad.

This is known as "camphor weed" from the strong odor of camphor which pervades the entire plant. It has the general appearance of *C. rudis* Greene, but the distinctly double pappus and noticeable rays preclude it from the Section *Ammodia* to which *C. rudis* belongs. It belongs to the Section *Euchrysopsis*, according to Gray's classification in the Synoptical Flora, and comes nearest to *C. echioides* Benth. From this it differs in pubescence, inflorescence, smaller heads, and fewer rays. As I have not seen a specimen of the type of *C. echioides*, my judgment is based on the description in Botany of the Sulphur, p. 25. The type locality of *C. echioides* is Bodegas, or, as it is now known, Bodega Bay.

This species was discovered by the Hon. Horace Davis, near his country-place in the Santa Cruz Mountains, near Glenwood. It grows on the old sea beaches, peculiar to these upland hills, and blooms in July and August. It would be interesting to investigate the properties of this plant. The oil which it contains might be of use in the arts or medicinally.

Helianthella Cannonæ. Stems several from a slender, woody, horizontal rootstock, erect, simple, monocephalous, about 3 dm. high, ribbed, canescent, with spreading, soft, jointed bristles. Radical leaves oblong, lanceolate, or spatulate, 6–12 cm. long, 2–4 cm. wide, tapering at base and decurrent on the broad, nerved petiole which is almost as long as the blade; apex obtuse, generally mucronate; texture thick, scabrous, with short pubescence and longer scattered, jointed appressed hairs; margin ciliate with bristle-like hairs; midvein broad, light green conspicuously striate; cauline leaves 2 or 3 and alternate or, rarely, 2 or 3 pairs and opposite, similar to the radical leaves but smaller, 1–2 dm. distant from the broad head, which is 8 cm in diameter exclusive of the outer foliaceous bracts. Bracts of the involucre in 3 or 4 series; inner ones lanceolate, acuminate, striate, densely white ciliate on the margins near the base, outer surface more or less scabrous pubescent and hirsute; inner surface rugose and scabrous; outer bracts similar to the leaves, from 2–12 cm. long, 4–20

mm. wide, variable and passing to the form of the innermost by gradations. Rays sterile, conspicuous, 2–3 cm. long, 5–7 mm. wide, obtuse or emarginate. Chaff of the receptacle boat-shaped, striate, hairy near the apex, 5–7 mm. long; receptacle flat, pitted with triangular or quadrangular, shallow depressions: tube of the corolla dilated above the insertion of the stamens, glabrous; divisions 5 acute, thick, hairy; akenes cuneate, sometimes ciliate near the apex of the narrow wing, with pappus of 2 or 3 glabrous or hispid awns which are generally deciduous on the ripe akenes. Seed dark brown, somewhat glossy, glabrous except for a few occasional hairs, tumid, cuneate, emarginate, 9–11 mm. long, 5–8 mm. wide.

This showy Helianthella is found on the hills of San Francisco. It was first collected by Miss Evelina Cannon, on Bay View Hills, May, 1892; later it was collected by the author on the Presidio Hills and Bay View Hills. It is most abundant at the last-named locality. Indeed, recent search has failed to rediscover it at the former locality, and it may now be extinct there. Changes are being continually made incident to the growth of the city and improvement of the Presidio as a military station.

It is probably the Helianthella collected by Frank H. Vaslit on hills east of Ocean View, which was identified with *H. Californica* Gray (Zoe 11, 75). No specimen of this is in the herbarium of the Academy, and it was probably not preserved. Any one who has seen the two species could not fail to recognize their separate identity. *H. Cannonæ* differs from *H. Californica* in habit, foliage, akenes, and pappus, but especially in the large showy heads, framed by the long leaf-like bracts.

It is named in honor of Miss Cannon, who first collected it and who has done much to increase our knowledge of the plants of San Francisco Peninsula.

Sphacele gracilis. Shrubby at base with spreading branches 3–6 dm. high; old stems with light brown, shreddy bark; young stems reddish, slender, becoming filiform at the upper extremity, quadrangular and striate; entire plant except corolla clothed with very fine, white pubescence and sessile,

yellow glands. Leaves oblong, obtuse, dentate, crenate or sinuate, with the veins conspicuous on the lower surface but not bullate, pale green, somewhat scabrous, 2–6 cm. long, 1–2½ cm. wide, tapering at base and decurrent on the short petioles which are about 1 cm. long. Racemes 6–20 cm. long with internodes 1–4 cm., verticels 2-flowered, pedicels filiform, 1 -1½ cm. long, bracts ovate, sessile, acute, a little shorter than the pedicels. Calyx campanulate, thin and veiny, with the base acuminate in flower, rounded when in fruit and becoming broad, 1½–2½ cm. long; divisions deltoid, acuminate to a slender point, ⅓ as long as the entire calyx. Corolla white, tinged with rose-color, 3 cm. long, with the lower lobe extending 1 cm. beyond the throat. Stigma exserted, pink. Nutlets dark brown, white pubescent, several sided with rounded angles, 3 mm. in diameter.

This seems to be local in the Santa Lucia Mountains, having been found in one locality only, namely, on the hill separating King City from Jolon, near Mansfield's ranch. It is readily distinguished from the variable *S. Calycina* by the slender, graceful habit, lack of tomentum, pinkish flowers, peculiar calyx and seeds. The specimens from which the description was drawn were collected by the author in both flower and fruit, June 7, 1893. It grows in the same locality as the equally local *Malvastrum involucratum* Robinson.

Mimulus modestus. Hispid and somewhat glandular, dwarf, 2–4 cm. high, simple or more frequently branched from the base; the stems rather thick and leafy with the internodes shorter than the calyces. Leaves with broad, clasping petioles, half as long as the blades; the latter 7–15 mm. long, 5–10 mm. wide, spatulate, to oblong-spatulate, or frequently nearly orbicular, obtuse at apex, entire or serrate with blunt teeth, strongly 3-nerved or rarely 4-nerved from the base, glabrous and purplish on the lower surface, hispid on the upper, rather thick and inclined to be bullate. Flowers solitary on peduncles about 3 mm. long, in the leaf-axils of all the leaves, even the earliest. Calyx slightly arcuate linear-oblong, 6 mm. long, equally oblique at base and apex, 5-toothed, strongly angled with conduplicate folds, the part surrounding the ovary and fruit membranous, the

upper part foliaceous. Corolla with the slender exserted part of the tube as long as the calyx, throat funnel form, border almost equally 5-lobed, about 1 cm. in diameter, crimson with the three lower lobes deeper crimson at base and mottled with white and yellow deep in the throat. Stamens equally inserted in two pairs with glabrous filaments and minutely tuberculate anthers; the longer pair with anthers connivent and forming a cross, the cells of each part confluent at apex; the lower with but one anther fertile. Style hairy. Stigma purple, bilamellar, the upper part ovate-acuminate, 2 mm. long, ciliate, papillose on one side, hairy on the other; the lower part triangular, minute, scale-like. Capsule 5–6 mm. long, sulcate on the valves, with a wing-like ridge down one side where it is gibbous at the base, obliquely ovate, acute. Seeds (immature) oblong, tuberculate, numerous.

This undoubtedly belongs to § *Eunanus* but differs from any other that has been described.

It was collected on the old Bolinas Trail on Mount Tamalpais, March 18, 1900. It monopolized the ground for a few square yards not far from the top of the ridge, where the ground was dry and hard as if it contained clay. Two years ago the writer found a single specimen of the same *Mimulus* on the Bolinas Road, not far from Fairfax.

Aphyllon violaceum. Stems 6 cm. underground, one to many from a fleshy rootstock from 5–15 mm. in diameter; scales deltoid. Entire plant glandular viscid even to the corolla. Flowers crowded in corymbs blooming from the ground or below and 3–4 cm. high. Pedicels thick, 2–5 cm. long; bracts linear, close to the calyx. Calyx dull violet unequally divided almost to the base, with the divisions 1 cm. long, 1-nerved almost sub-carinate, narrowly linear-subulate, acuminate; margin beset with stipitate glands. Corolla dark violet, veiny with tube twice as long as the calyx, curving outwards, ringent; upper lip 12–15 mm. long, 10–12 mm. wide, with the lobes almost half the entire length, 5 mm. broad, acute or obtuse; sinus separating the lobes obtuse. Lower lip 3-cleft to the throat with widely separated divisions, oblong-ovate, acuminate, 12–13 mm. long, 5 mm. broad; the middle lobe narrowed at base where the margins curve

inwards and are bounded on each side by a deep bright yellow fold which extends down the tube to a little above the insertion of the stamens and when spread out is as wide as the divisions. Stamens and stigma exserted, the latter surpassing the former and declined onto the folds; stigma white, peltate 3 mm. in diameter. Stamens didymous, the upper pair slightly longer than the lower, inserted equally on the corolla tube about 5 mm. above the base, not dilated at base. Anthers yellow, horseshoe shaped with rounded or emarginate apex and the bases sharply mucronate, clothed with long, curly, white hairs. Ovary oblong, tinged with violet. Immature seeds globular, papillose.

This beautiful Aphyllon was collected by the author on Vision Hill, west of Tomales Bay September 1, 1900. It was parasitic on Grindelia. It belongs to the same group as *A. comosum* Gray and A. Californicum Gray. It may be one of the forms included under the former species but it is unlike the figure of the type and none of the descriptions allude to the prominent yellow folds on the lower lip. The description was drawn from the living plants.

Asclepias Kotolo. Tall and stout, about 1 m. in height, the simple stems hollow and cylindrical, 15 mm. in diameter near the base. Leaves opposite, ternate or rarely quaternate, 10–25 cm. long, 5–8 cm. wide, oblong; cordate truncate or cuneate at base; the apex obtuse, acute or acuminate and mucronate; margins entire or somewhat sinuate; coriaceous, canescent with soft, velvety tomentum, the upper surface of the leaves becoming smoother with age; midrib broad with the chief veins and reticulations noticeable under the tomentum; petioles thick from almost none to about 1 cm. long, 5 mm. broad, with the upper surface concave. Umbels when in flower near the top of the stem but in fruit appearing about the middle, owing to the growth of the upper stem; involucral bracts linear-lanceolate, varying from 5–20 mm. in length. Flowers fragrant, 30 or more in each umbel, on pedicels 2–4 cm. in length, which in fruit become stouter and longer. Sepals and petals reflexed, the former green with the outer surface densely tomentose, the inner glabrous except near the apex, ovate-acuminate to oblong, unequal, 2–3 mm. long.

Petals white tinged with rose-color or with the midrib rose-color, 3 petals broader than the others; the former elliptical, 7 mm. long, 4 mm. broad; the latter oblong, 2–3 mm. broad; apex acute, margin membranous. Column short; hoods glabrous ventricose with a tooth-like swelling on each side near the base and subtended by a ring which extends to the wings of the anthers; truncate along the top, not open down the back; horn inserted along the entire length of the back with the body protruding in the shape of a camel's back from the opening in the hood and often with a distinct tooth where the hump curves down to the slender acuminate upturned horn which extends above the stigma. Capitate stigma and leaf-like appendages which cover it, greenish white. Abortive ovaries glabrous, fertile ones white-tomentose. Pods erect, pendent or horizontal, on deflexed pedicels which are inclined to be curved at the bend, obliquely ovate-acuminate with the apex curved upwards, about 10 cm. long and 3–4 cm. wide near the base, the broad veins visible beneath the velvety tomentum. Seeds ovate or spatulate, reticulate, the margin narrow.

Cleomella alata. Glabrous or slightly viscid-pubescent, 2 to 5 cm. high, low and spreading, branched from the base and also above. Stems winged. Leaves trifoliate; stipules of soft bristles; petioles broad, winged, equaling or shorter than the leaflets; leaflets petiolulate, linear-oblong, 1–1.5 cm. long (the middle leaflet longest), 2 mm. wide, somewhat fleshy, with strong mid-nerve and thickened margins, apex aristate with a soft bristle .5 mm. long. Fowers corymbosely crowded in the upper axils on filiform, elongating peduncles, 5 to 10 mm. long; the upper leaves or bracts becoming simple and similar to the leaflets. Calyx of 4 triangular-acuminate divisions, 1 mm. long. Petals 4, yellow, obovate, 2 mm. long. Stamens included, 5 or 6, 2 united by the filaments, twice as long as the anthers; anthers oblong, mucronate. Capsule (immature) on a stipe .5 mm. long, obovate, inflated. Style very short, less than .5 mm., divided half way.

This belongs to the same group as *Cleomella obtusifolia* Torr. & Frem. but it is quite distinct from any of the group.

It was collected by Mrs. Bruce at Shumway, Lassen County, California, June, 1898 (no. 2364a).

Peucedanum Jaredi. Tomentose throughout, tap-root woody, long and vertical. Caudex very short, underground, with several equally short divisions, sheathed with the dilated petioles. Leaves bipinnately dissected, main divisions 4 to 6, ultimate divisions crowded with minute obtuse lobes; leaves on young plants, without flowers, 2 dm. long, the unsheathed part of the petiole about as long as the lowest internode of the rhachis; leaves on flowering plants not more than 10 cm. long and much smaller. Peduncles stout, ribbed, reddish, about as long as the leaves when in flower but elongating in fruit to more than twice or thrice their length, from 5 cm. to 2 dm. Umbel with unequal rays, 3 to 5 cm. long, becoming glabrate, generally with 1 or 2 ovate-accuminate bracts, 2 to 10 mm. long, with white membranous and tomentose margins (bracts rarely foliaceous). Involucel of one palmately 3 to 5-cleft unilateral bractlet, the different bractlets united, or all separate, tomentose and membranously margined; pedicels 5–10 mm. long. Calyx divisions green and almost glabrous with white-membranous margins, minute, deltoid. Petals green, fading yellowish, strongly circinate, margins densely white-tomentose. Stamens yellow, the exserted filaments 1.5 mm. long, anthers broadly elliptical, emarginate at apex, cordate at base. Carpels almost orbicular, 6 mm. wide, 7 mm. long, cordate at base; wings glabrate about as broad as the tomentose body; oil tubes on the commissural surface 3 or 4, on the dorsal 2 or 3 between the ribs.

This beautiful Peucedanum was collected near Estrella, San Luis Obispo County, by Mr. L. Jared, in whose honor it gives me great pleasure to name it. The fruit is quite flat owing to the thin ribs, the ovaries are densely tomentose but become less so with age. The most noticeable character is to be found in the flowers which are green, but appear white from the dense tomentum bordering the petals.

Navarretia ocellata. Annual, with several stems spreading from the root, clothed with short branchlets, cinereous tomentose, reddish. Leaves withering early, twice pinnatifid with filiform spinulose divisions extending to the base of the flattened rhachis, glabrate near the apex, tomentose at the base, 15–20

mm. long, 10 mm. wide, ovate-acuminate in outline. Flowers in dense globular heads terminating the branchlets, those on the main stem largest and often consisting of several heads together. Bracts surpassing the flowers, bipinnatifid, with stiff, spreading filiform, spinulose divisions, the dilated rhachis and lower divisions clothed with long, white, jointed hairs, the upper divisions sparingly stipitate glandular, calyx with two divisions pinnatifid, filiform, spinulose, almost equaling the corolla, the other three half as long, subulate spinulose, with pubescence similar to that of the bracts; calyx tube white, equaling the divisions strongly ribbed, with membranous folds between the ribs. Corolla yellow with brown spots in the throat; tube filiform, 7 mm. long, somewhat stipitate-glandular; throat funnel-form spreading campanulately to the oblong divisions 2.5 mm. long, 1.5 mm. wide. Stamens scarcely exserted, filaments unequal, inserted high in the throat of the corolla. Pistil with style 2-cleft at apex, stigmas capitate, not extending to the line of insertion of the stamens. Capsule obovate, mucronate, upper part thicker than the membranous lower half, 2 mm. long, 1.25 mm. wide; loculi 2; seeds 8 or by abortion fewer, brown, irregularly angled, with the angles pale brown.

This belongs to the same group as *Navarretia cotulæfolia* H. & A. It is easily distinguished from the other members of the group by the yellow corolla spotted with brown. There is no noticeable odor about the dried plants as is often the case with other species of the group.

It was collected by Mr. L. Jared at Goodwin, San Luis Obispo County, February, 1896.

Navarretia Jaredi. Slender annual, about 7 cm. high, branching from the base or along the main stem, sparingly cinereous-tomentose, the upper leaves, bracts and calyx clothed with gland-tipped hairs. Leaves 15–20 mm. long, simply pinnatifid with narrow linear divisions diminishing downwards to the leaf axil or with the upper part laciniately cleft, the divisions all spinulose. Bracts carinate, with a strong mid-nerve, pinnately 5 to 9-cleft with spinulose divisions, the involucrate bracts surpassing the flowers, the inner ones surpassing the calyx.

Heads of flowers terminating the branches, about 15 mm. across. Calyx with the two longer divisions, equaling the corolla, 3-cleft, the others linear, entire, as long as the corolla tube, all spinulose. Corolla salver-form, violet; tube ribbed, glandular-pubescent, almost as long as the divisions, dilated at the base and throat; divisions oblong, equal, 4 mm. long, 2 mm. wide. Stamens exserted, filaments blue, equally inserted in the throat of the corolla, anthers green. Style surpassing the stamens barely 2-lobed at apex. Ovary with 2 loculi and 2 ovules. Fruit immature.

Collected at Paso Robles Creek, San Luis Obispo County, by Mr. L. Jared, who is well known for his diligent study and collection of the plants of San Luis Obispo County, and in whose honor it is named.

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